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ABSTRACT

Learners working on collaborative assignments in a face-to-face environment while using computers must engage in social as well as intellectual tasks. Indeed, at the residential undergraduate level, the development of interactive skills is often one of the more important aspects of their collaboration. Many existing facilities support such interaction badly, if at all. This author has undertaken a continuing investigation of persons-computer-facility interaction and has developed a series of learning facilities that appear to strengthen the quality of learner interaction by increasing time on tasks. This report demonstrates the process of creating groupwork oriented class and study spaces, the challenges and variables encountered, and the first pedagogical results of this work-in-progress. It also explores pedagogical issues and strategies for instructors using such arrangements. (Author)

Thinking Outside the Circle: the Design of Face-to-Face Collaborative Learning Facilities

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Abstract: Learners working on collaborative assignments in a face-to-face environment while using computers must engage in social as well as intellectual tasks. Indeed, at the residential undergraduate level, the development of interactive skills is often one of the more important aspects of their collaboration. Many existing facilities support such interaction badly if at all. This writer has undertaken a continuing investigation of persons-computer-facility interaction and has developed a series of learning facilities that appear to strengthen the quality of learner interaction by increasing time on tasks. This report demonstrates the process of creating groupwork oriented class and study spaces, the challenges and variables encountered, and the first pedagogical results of this work-in-progress. It also explores pedagogical issues and strategies for instructors using such arrangements.

Overview:

This paper is about fostering collaboration, and in particular about fostering collaboration among learners who work together in face-to-face environments and use computers. In practice such learners also tend to use computer tools on their own: e-mail, online learning environments such as Blackboard and WebCT, the web itself, PowerPoint, and a variety of other options. Collaboration can take place in a classroom with an instructor, in other learning spaces with an instructor, and in a variety of settings without an instructor present.

The use of collaboration to prompt learner interaction has been much noted in the educational literature. Learners in interactive groups are more likely to play active than passive roles. The participative nature of such learning experiences can lead to social reinforcement for participation from other group members; the negotiations required in interactive activities are also useful in modeling other forms of social interaction, such as occur in many workplaces. Such results are not automatic, however, and faculty need to understand how to nurture these processes.

The rise of useful computer technologies in the last decade—tools such as the World Wide Web or PowerPoint, and (more recently) video editing---and the increasing availability of such technologies in schools, colleges and universities, make these things seem ready-made for collaborative learning activities. Many faculty create assignments requiring groups to use such tools for research or for reporting.

Unfortunately, the actual use of technology by groups can occasion some difficulties. Most computer installations are designed for single users and are not easily shared by groups. When more than two learners attempt using such facilities, one or more tend to hold back, to be passive, to observe at some distance. This is not useful in facilitating the group goals.

I first encountered these problems while teaching classes in Instructional Technology and observed students assuming uncomfortable postures while trying to share a screen with a group. This led in turn to an iterative process of observation, experimentation, and the development of learning facilities and pedagogical procedures.

This paper will recount the paths taken, and will provide a preliminary report on the latest steps, classrooms specifically designed for group work at computers. It will also consider the issues involved in teaching and learning in such environments. You will find updated information at the listed website.

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Background:

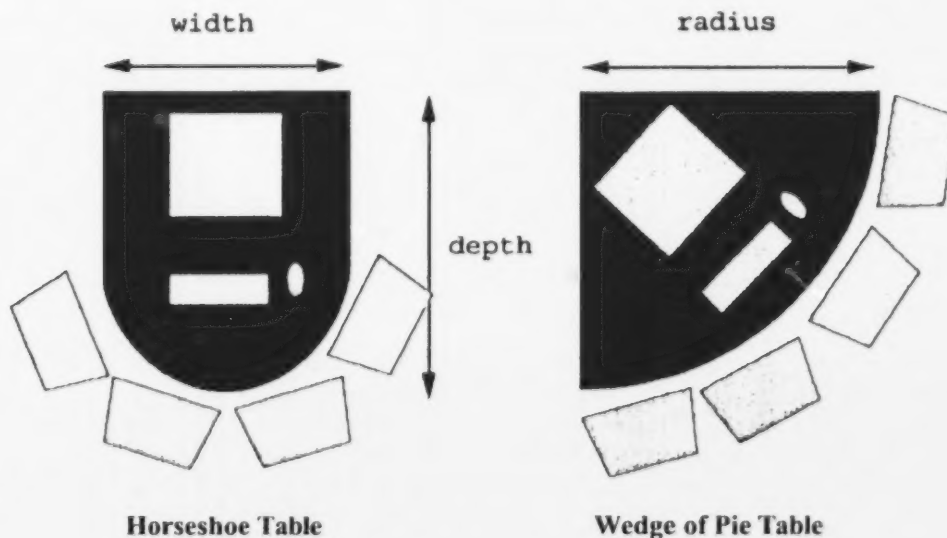
In 1992 I first observed that students who attempted to share a computing task encountered a series of physical barriers. Computer labs were routinely organized in rows, monitors were just large enough for a single user, and the close spacing of computers precluded more than a pair of students sharing a screen. The rapid growth of the Web in the mid 1990's prompted a sense of urgency in solving this problem and a 1998 sabbatical provided an opportunity to undertake some experiments.

In 1972 I studied the design of learning facilities at Indiana University with Visiting Professor Gerald McVey. I was introduced to Robert Sommers' chapter Small Group Ecology, in his 1969 volume *Personal Space*; it then seemed particularly trenchant. It still is. Sommers showed the seating chosen by library users for different sorts of tasks. Those engaged in cooperative tasks tended to select arrangements that facilitated eye-to-eye contact. They also demonstrated a tendency toward adjacency. In the mid-1990's I renewed my acquaintance with Sommers' work and bent it to my purposes.

Sommers' insights led me to create a series of cardboard mockups of computer workstations in different shapes and sizes. These were tested with small groups of students. Their feedback in turn resulted in the design and construction of two working prototypes, one shaped something like a horseshoe, the other like a wedge of pie. The stations were provided with large 21 inch monitors and armless chairs with castors, to facilitate easy movement by users. These workstations were placed in a student computing area; faculty were asked to bring or direct their students to these stations, and, with their consent, I observed the student's interactions.

It was quickly apparent that students working at these stations spent greater time on task, that more individuals participated in activities, and that their products were more representative of the group than of some leading individual. This prompted further experimentation on more subtle variations.

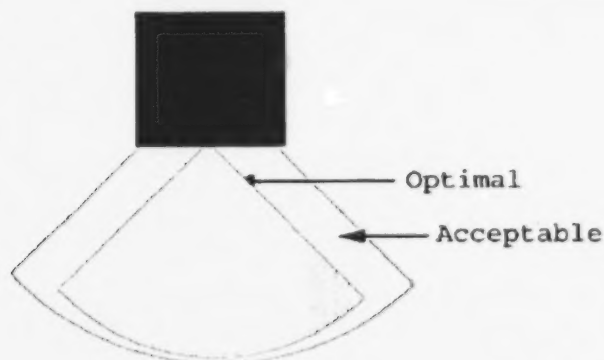
The hallmark of all these designs has been the use of a partially circular table, with the learners literally gathered 'outside the circle.' This circular form has become a sort of trademark for our subsequent efforts.



The Horseshoe model has proved the most popular design of several we have tried and has become the progenitor of most of our later efforts. The Wedge of Pie model is also effective, but less effective and less

popular than the Horseshoe. This apparent difference is probably due to the superior sight lines provided by the Horseshoe model.

These units require satisfactory sight lines AND fields of view, as in the drawing below:



Optimal and acceptable fields of view

In a well-conceived installation, each participant should have good sight lines to the screen and to every other participant, without excessive movement being required. And each participant should sit within at least the acceptable field of view. It is typically the fields of view that determine realistic seating capacity at a particular table.

Our empirical development process led me to postulate some norms for the design and construction of our collaborative stations. The dimensions of the furniture and equipment appear to occupy a narrow range if the stations are to be effective.

The Horseshoe Table needs to occupy a rather narrow range of sizes for effective performance, ranging from 4 to 5 feet in width, and 4 to 5 feet in depth. Width determines seating, or is determined by the desired number of seats. Depth needs to be determined by equipment: larger computers and large CRT monitors require more depth, while smaller computers and LCD monitors can get away with slightly less depth. Here are the combinations we currently favor:

Width	Seating capacity	Monitor (diagonal)	Depth
42 inches	3 (4 very difficult)	19" is adequate	48-54 inches
48	3 or 4	19-21"	48-54 inches
54 inches	4 (5 is difficult)	21-22"	54"
60	4 (5 is manageable)	21-22"	60"

We have found 21-22" monitors to be cost effective in current units, thanks to drops in pricing. We normally configure monitors at SVGA or XGA resolution, as required to insure that everyone can read text adequately. Monitors are set as far back on the tables as is practicable to increase field of view.

Keyboards and mice are simply placed on the tabletops without mouse pads, and passed from one user to another. While we at first anticipated a need for wireless keyboards, the wired version has proved quite adequate. The larger tables also provide adequate room for some ancillary devices such as scanners.

The Wedge of Pie units do function adequately and prove useful in certain locations where corners or rooms are available. The optimal dimensions for these units require a radius from 4 to 5 feet, and, as with the Horseshoe units, larger installations require larger monitors.

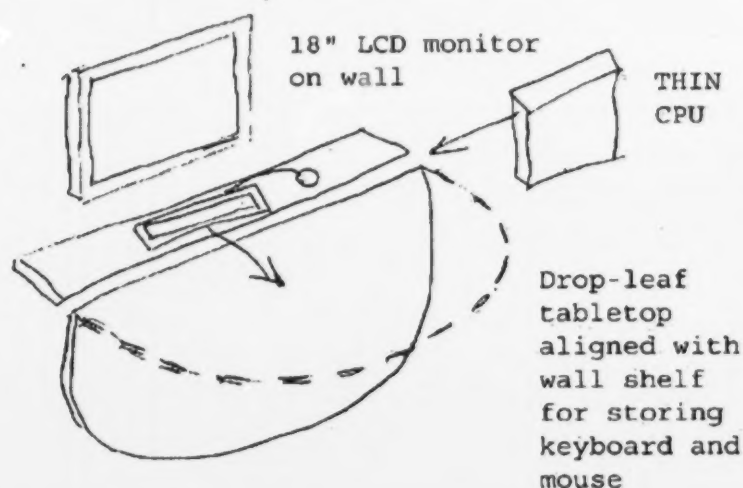
New Options:

The original workstations were used outside of class by students, or by students and faculty. It gradually became clear that some faculty wanted the benefits of such workstations WITHIN their classrooms. This was often expressed as 'responding to class interests,' or 'the teachable moment.'

Our college has responded with energy to the desire of faculty for 'smart' classrooms equipped with a computer and data projector, and for 'studio' classrooms which also have a number of computers for individual students AND a central seminar table. These options do not permit small groups of students to work together, however, and so we have explored other options.

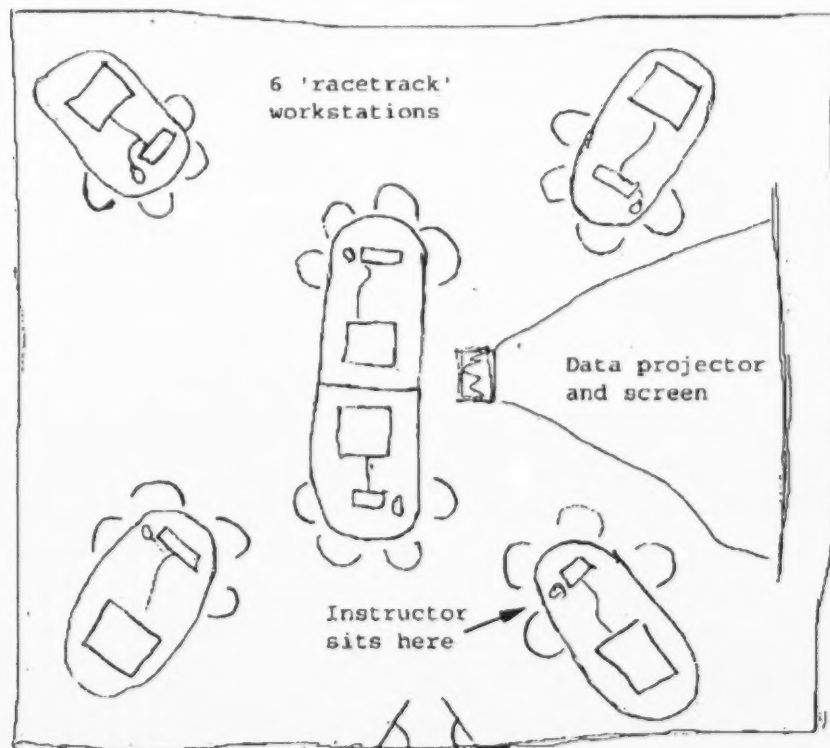
Two new types of facilities have emerged. While similar, they each have distinct features:

1. A language facility, recently funded, provides for a convertible classroom in which the teacher can change configurations in a very brief time by moving chairs and sending learners to stations that are installed along walls. These are described as the 'barnacle' model and the prototype is under construction as of this writing. (It should be in operation by the time this paper is actually presented, and will be illustrated on the website.) This room is intended to provide maximum flexibility for ongoing classes so that a teacher can show a videotape clip, hold a discussion with all students, send groups to computers, and bring everyone back for a meeting of the whole, all within a single period. This room will be assigned to courses for an entire semester.



The barnacle unit has been designed to occupy only 9-10" of depth along a classroom wall. We are placing 4 units in the initial classroom, along with an instructor's station designed to do double duty as a group workstation. In a classroom equipped with simple tables and chairs, it will be possible to switch modes very quickly. These installations will take up very little floor space, so will not have a negative impact on existing classrooms. These stations depend on the availability of affordable 18" or larger LCD monitors and the recent availability of compact CPUs that can be mounted on their sides in tower fashion.

2. The second facility is somewhat similar in its equipment but radically different in its expected application. (Its equipment is being installed as of this writing and, again, updated information will appear at the website). This model is designed SOLELY for group activities. Located in the Library as part of our Information Commons project, this room is equipped with six workstations each seating up to four learners. Each station is equipped with a compact computer, a scanner, and a large (22" diagonal) monitor. Station dimensions are detailed below. The room also incorporates a data projector and a player for video/DVD. The room is intended to be available on a period-by-period basis for courses, and will be available for use by groups working outside of class at all other times.



The use of an oval 'racetrack' table may seem unusual; the rounded rear of the tables is a somewhat cosmetic feature that responds to the tendency of janitorial staff to align straight lines in furniture with adjacent walls. As we wanted four of the tables to 'float' at roughly 45 degree angles to the walls, we chose to use a circular form at each end.

Both facilities should be regarded as well-informed experiments.

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Collaborative Learning in face-to-face groups ("f2f")

Any group of faculty will offer a range of motivations for wanting to use collaborative learning. Some simply seek a change from more traditional modes of instruction. Others are committed to group processes because they believe it reflects much of the actual work and learning that takes place 'in the real world.' Still others subscribe to constructivist theories of learning and believe that it is only through their own self-aware and active engagement in the learning process that learners can become autonomous.

While the notion of collaborative learning has held buzzword status for a number of years and is generally thought to be a "good thing," it is important to isolate several types of collaboration that may be taking place simultaneously.

- a. Using technology: every collaborative group in these environments spends some time simply using the relevant technology; this usually involves a learning component and a series of decision components. In creating a PowerPoint presentation, to give a simple example, it frequently happens that some students are more adept with the software than the others. They share a number of simple decisions about what features to use, and some learn technology skills from others. In this instance we often suggest that faculty tell students to 'pass the mouse' to insure that all participants literally have a hand in the mechanical process. This can run contrary to student wishes, as the learners would often prefer to leave the manipulation of the technology to those who are already adept.

Sometimes the use of the technology is actually the primary learning goal for part of a lesson. Students learning to manipulate library catalogs, for example, may be encountering software that is new to every member of their group, and a strategy for insuring that each group member participates is essential. This is a situation in which the presence of the instructor during the learning session is very important.

- b. Much of the time collaboration will entail manipulating higher level, less mechanical concepts. The design rather than the construction of a PowerPoint presentation, or the search for information upon which to base it, is one example. Making decisions about video edits is another. Here, the role of the instructor is more similar to that in traditional class discussions: helping learners to weigh ideas, to consider other options, encouraging the group to find a consensus that exceeds some least-common denominator.
- c. Students also engage in a range of social collaborations. Some of these are inevitable and desirable, while digressive behavior needs to be contained. Faculty may do best by encouraging students to focus on assigned tasks rather than remonstrating about digressive behavior. It is important for both students and faculty to recognize that purely social activity is not the same thing as collaborating. However, it is equally important for faculty to recognize that effective collaboration virtually requires a social dimension, and that practice in social negotiation is an important aspect of the process for undergraduates.

These forms of collaboration and perhaps others are all interwoven in practical learning situations. At one moment the group is being social, at another it considers technology, and at still another it works on a higher level goal. The group will alternate rapidly among these modes.

It is also very important to recognize that learners come to the collaborative process with a range of skills and a range of motivations, that they are by no means equals. The recent literature has made it clear that there are differences among learner's success rates in face-to-face and online collaboration. Since some individuals are more confident in working online than in live groups, it makes sense to create both face-to-face and online aspects for group learning tasks. It may well make sense to begin collaborative tasks online in order to help enfranchise the more reticent members of the group, then use that experience to help cement the face-to-face groups.

My office supports students and faculty using group workstations. Over time, it has become quite evident that some faculty profit from some assistance in structuring assignments, and some students need some feedback or prompting during the learning process. These two needs are in some ways more interesting than the facilities themselves.

Consider this example: A faculty member new to PowerPoint decided that program offered beneficial possibilities in the learning process. The student groups were to manipulate this presentation medium and create presentations that they obtained from external research. The instruction was to 'create a PowerPoint presentation,' which seemed analogous to the instruction 'write a paper.' The creation of papers, however, is undergirded by years of experience on the parts of both teacher and learners. Few teachers or students have anything approaching that depth of historic experience with PowerPoint. Somewhat predictably the groups created presentations with excessive reliance on transitions and effects that contributed little to the communications and actually reduced quality. The instructor was disappointed by this result, but thought the collaborations had worked well. Conducting a *post mortem*, we discovered that the instructor had felt apprehensive about personal PowerPoint skills so had stayed out of discussions, simply watched the groups from afar. More active feedback to the groups would have prompted more time on the higher level issues, and less on technical frills. In fact, a second round of sessions with the same instructor was found to be much more satisfying.

As antidote to these sorts of problems, I offer faculty a (growing) series of heuristics that can help guide them in using electronic tools for collaboration.

Conclusions:

The results of our most recent experiments will be on hand by the date of this presentation. We have high expectations for both the 'barnacle' and the collaborative classroom models. We will be tracking performance of both in-class and out-of-class users. Our past experience with collaborative facilities has been very positive, and these new facilities should run true to form.

Reference

Sommers, Robert (1969): *Personal Space*. Englewood Cliffs, New Jersey: Prentice Hall



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